PARTICULATE LEVELS MONITORED IN THE CITY OF TIMMINS FROM 1978 to 1984

NER-AQTM-13-85

Ministry of the Environment
Ontario

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Summary:

Settleable particulate has been monitored in Timmins, using dustfall jars, since 1978. Two jars were located near the McChesney Lumber Co. Mill during 1978 and 1979 and were removed after an abatement program was implemented. Two jars were located near the Waferboard Corporation plant on Hwy. 101 in 1978, with one being discontinued in July, 1980 and the second operating until the present.

Settleable particulate monitored using dustfall jars was within acceptable levels at three of the four locations. The Provincial Criterion of 7.0 $g/m^2/30$ days was regularly exceeded near the Waferboard Corporation Limited plant on Highway 101. Examination of the samples by optical microscopy indicates that a high percentage of the material is of wood origin.

In 1984, a high volume sampler was installed in the business section of Timmins to monitor airborne suspended particulate. High volume samples collected that year show low levels of suspended particulates and trace metals.

The Ontario Ministry of the Environment will continue to monitor suspended particulate in the business section of Timmins. The settleable particulate monitor near the Waferboard Corporation Ltd. plant has documented a problem and will be discontinued until further monitoring is warranted.

Introduction

In March, 1978, four dustfall jars were installed in Timmins to monitor settleable particulate in the community at the request of Timmins District staff. Two of these jars were located in the built-up section of the City to monitor particulates originating from woodwaste burner at the McChesney Lumber Company mill. The remaining two jars were located near the Waferboard Corporation plant on Highway 101, west of the City. In January of 1984, a high-volume (hi-vol) sampler was installed on the roof of the building which houses the Ministry of Health laboratories at 67 Wilson Avenue to monitor general air quality in the business section of the city. This report summarizes data collected from March, 1978, to December, 1984.

Sampling Techniques

The sampling technique used for dustfall and hi-vol sampling are outlined in Appendix A. In addition to total dustfall, samples collected in Timmins are examined by optical microscopy to determine the composition of the particulate. Hi-vol samples were analyzed for total suspended particulate and trace metals. Trace metal concentrations were extremely low during 1984, with only iron exceeding the criterion on one occasion.

Sampling Results

Dustfall Sampling

A summary of total dustfall data collected from 1978 to 1984 is presented in Table 1. Locations of dustfall monitors are included in Figure 5. A summary of total dustfall at individual locations is presented in Tables 2 to 5 and Figures 1 to 4.

Total dustfall exceeded the monthly ambient air quality criterion of 7.0 $g/m^2/30$ days, as outlined in Ontario Regulation 296, on one occasion at Ecole Secondaire Theriault (72019) and at Gilles Street (72026) during 1978. The yearly criterion was not exceeded at these locations during 1978 (10 months data used to calculate mean).

The monthly criterion was exceeded on 44 occasions (or 60% of the samples) at the Waferboard Corporation location (72034) from March, 1978, to December, 1984. The yearly criterion was exceeded in all years from 1978 to 1984 at this location. There were no exceedances of the monthly or yearly criterion at the Notre Dame Trailer Park (72028) from March, 1978, to July, 1980.

Examination of material using optical microscopy was carried out on approximately one-half of the samples collected at Waferboard Corporation (72034) since 1980. The results

indicate that a large percentage of settleable particulate in the area is of wood origin (wood fibres, wood char, wood material). Table 6 summarizes the percentage of total dustfall that can be attributed to the wood material. Yearly mean values ranged from 86% to 96% with a maximum value of 100% wood material observed in 1982.

This high percentage of wood material in settleable particulate implicates the emissions from the Waferboard Corporation plant as the major source of dustfall.

High-Volume Sampling

Samples collected using the high volume (hi-vol) technique at the Ministry of Health laboratory (Station 72077) in downtown Timmins during 1984 indicate that suspended particulate levels were generally within acceptable levels. Results of total suspended particulate analysis (T.S.P.) are presented in Table 7. Only two exceedances of the Provincial Criterion of 120 ug/m^3 for 24 hours were observed during 1984. The annual geometric mean of 34 was well below the Provincial Criterion of 60 ug/m^3 for 1 year (geometric mean).

Hi-vol filters were analysed for metals outlined in Table 7. Metal levels were low with only one exceedance for iron noted during 1984. It must be noted that copper values collected using the hi-vol technique are not considered reliable.

Conclusions

Four dustfall jars installed in Timmins in March of 1978 indicated that settleable particulates are within acceptable levels at all but one of the locations. Samples collected near the Waferboard Corporation Ltd. operations (72034) on Highway 101, west of the City, have regularly exceeded the monthly criterion.

The yearly criterion of 4.5 g/m^2 was exceeded each year from 1978 to 1984 at the same location. Examination of samples by optical microscopy, beginning in 1980, indicate that a high percentage of total dustfall was of wood origin (wood char, wood fibres, wood material).

High volume samples collected in the downtown area of Timmins indicate that total suspended particulates rarely exceeded the Provincial criterion during 1984. Results also showed that trace metal levels were low during the same time period.

Future Monitoring Programs

Dustfall monitoring near the Waferboard Corporation Ltd. plant on Highway 101 has documented a particulate problem and will, therefore, be discontinued.

Metal analysis on hi-vol filters collected at the Ministry of Health building will continue until at least one complete year's data has been collected.

Polynuclear Aromatic hydrocarbon (PAH) analysis will be carried out on hi-vol filters when laboratory techniques become available. (This is expected within the next year.)

DJB/av/DJB-14

Table 1

Annual Summary of Dustfall Data Collected in the City of Timmins
From March, 1978 to December, 1984

Location	Number of Samples Collected							Arithmetic Mean (g/m^2/30 days)						
	1978	1979	1980	1981	1982	1983	1984	1978	1979	1980	1981	1982	1983	1984
Ecole Secondaire Theriault (72019)	10	2	DISCONTINUED MARCH 1979					3.0	1.0	-	-	-	-	-
Gilles Street (72026)	9	DISCONTINUED MARCH 1979						2.3	-	-	-	-	-	-
Notre Dame Trailer (72028)	10	11	6	DISCONTINUED JULY 1980				2.5	2.2	2.4	-	-	-	-
Waferboard Corp. Ltd. (72034)	10	11	10	10	11	10	11	10.9	10.9	7.7	6.8	9.7	10.0	11.4
Total	39	24	16	10	11	10	11							

Table 1 (continued)

Location	Maximum Value (g/m^2/30 days)							Number of Samples Above Provincial Criterion						
	1978	1979	1980	1981	1982	1983	1984	1978	1979	1980	1981	1982	1983	1984
Ecole Secondaire Theriault (72019)	7.1	1.3	-	-	-	-	-	1	0	-	-	-	-	-
Gilles Street (72026)	5.2	-	-	-	-	-	-	0	-	-	-	-	-	-
Notre Dame Trailer (72028)	5.9	3.9	3.0	-	-	-	-	0	0	0	-	-	-	-
Waferboard Corp. Ltd. (72034)	25.9	21.0	19.7	12.1	38.8	16.1	26.0	9	8	5	3	4	6	9
Total								10	8	5	3	4	6	9

Provincial Criterion - 7.0 g/m^2/30 days (30-day period)

TABLE 2

Summary of Monthly Dustfall Data Collected at Station 72019
Ecole Secondaire Theriault in Timmins
From March, 1978, to February, 1979
(g/m^2/30 days)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
1978	-	-	1.5	0.1	7.1	3.7	2.8	3.3	3.6	3.9	3.2	0.4	3.0
1979	1.3	0.6	-	-	-	-	-	-	-	-	-	-	1.0

- Indicates data missing or invalid
Underlined values exceed Provincial Criteria
Monthly: 7.0 g/m^2/30 days
Annual: 4.5 g/m^2/30 days

TABLE 3

Summary of Monthly Dustfall Data Collected at Station 72026
Gilles Street in Timmins
From March to November, 1978
(g/m^2/30 days)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
1978	-	-	1.5	0.1	5.2	3.3	2.0	1.2	3.8	2.2	1.8	-	2.3

- Indicates data missing or invalid
Underlined values exceed Provincial Criteria
Monthly: 7.0 g/m^2/30 days
Annual: 4.5 g/m^2/30 days

TABLE 4

Summary of Monthly Dustfall Data Collected at Station 72028
Notre Dame Trailer Park in Timmins
From March, 1978, to July, 1980
(g/m^2/30 days)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
1978	-	-	1.0	0.1	3.8	3.1	5.9	1.1	3.7	2.6	2.6	1.2	2.5
1979	1.6	1.1	1.6	1.0	2.2	3.4	1.7	2.6	3.9	2.6	2.6	-	2.2
1980	-	2.2	1.7	2.7	1.7	3.0	3.0	-	-	-	-	-	2.4

- Indicates data missing or invalid
_ Underlined values exceed Provincial Criteria
— Monthly: 7.0 g/m^2/30 days
Annual: 4.5 g/m^2/30 days

TABLE 5

Summary of Monthly Dustfall Data Collected at Station 72034
Waferboard Corporation in Timmins
From 1978 to 1984
(g/m^2/30 days)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
1978	-	-	9.1	0.2	11.3	9.5	12.5	8.0	10.6	25.9	12.5	9.1	10.9
1979	15.4	21.0	15.3	5.8	12.4	13.7	3.0	7.0	10.8	7.5	7.5	-	10.9
1980	2.0	8.1	9.0	4.4	4.7	-	-	8.7	5.0	5.0	10.0	19.7	7.7
1981	5.2	9.6	-	4.8	8.5	5.8	-	6.6	5.1	5.5	5.1	12.1	6.8
1982	38.8	14.4	14.3	6.3	-	4.8	8.5	5.5	3.4	2.8	2.0	5.0	9.7
1983	5.0	-	6.0	3.9	6.1	15.9	12.4	-	10.6	16.1	8.7	14.9	10.0
1984	26.0	7.4	2.4	13.0	12.0	9.9	6.1	-	14.4	9.1	11.6	9.1	11.0

_ Underlined values exceed Provincial Criteria
Monthly: 7.0 g/m^2/30 days
Annual: 4.5 g/m^2/30 days

TABLE 6

Summary of Examination by Optical Microscopy
of Dustfall Samples Collected in Timmins
From 1980 to 1984

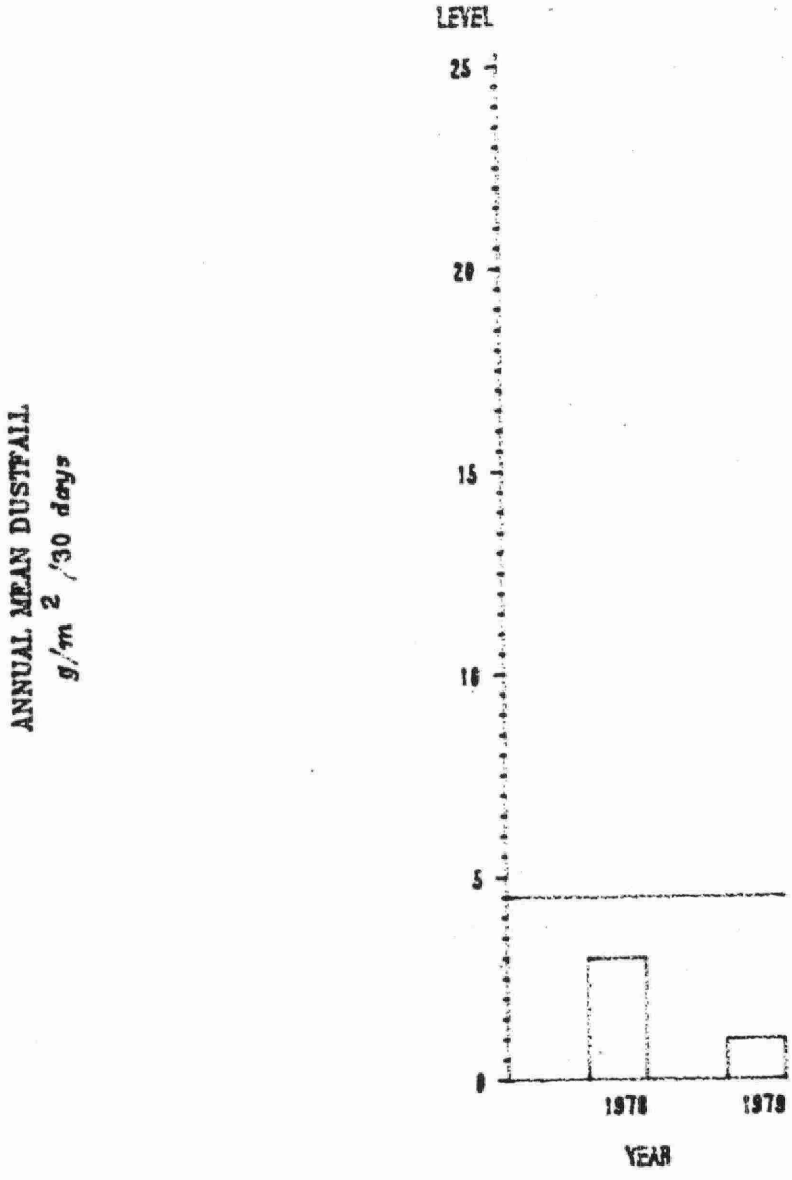
Sampling Location	Year	Number of Samples Examined	Percent Consisting of Wood Material	
			Mean	Maximum
Waferboard Corporation (72034)	1980	3	40	92
	1981	4	96	99+
	1982	6	91	100
	1983	7	95	99
	1984	6	86	98

TABLE 7

Summary of Total Suspended Particulate and Metal Analysis from Hi-Vol samples at the Ministry of Health Building, (Station 72077) in Timmins During 1984.

Parameter	No. of Samples Collected	Maximum Value (ug/m^3)	Geometric Mean (ug/m^3)	Provincial Criteron (ug/m^3)	No. Above Provincial Criterion
T.S.P.	44	169	34	120	2
Arsenic	37	0.008	0.001	25	0
Cadmium	37	0.002	0.000	2	0
Chromium	37	0.002	0.000	10	0
Cobalt	37	0.01	0.00	No Provincial Criterion	
Copper	37	0.27	0.06	50	0
Iron	37	5.3	0.5	4	1
Lead	36	0.4	0.1	3 - 30 day Arith. Mean	0
Manganese	37	0.126	0.017	50	0
Nickel	36	0.077	0.001	2	0
Vanadium	37	0.016	0.000	2	0
Zinc	17	1.1	0.9	100	0

ANNUAL MEAN DUSTFALL LEVELS COLLECTED AT ECOLE SECONDAIRE THERIAULT,STATION 72019 TIMMINS FROM MARCH, 1978 TO FEBRUARY, 1979

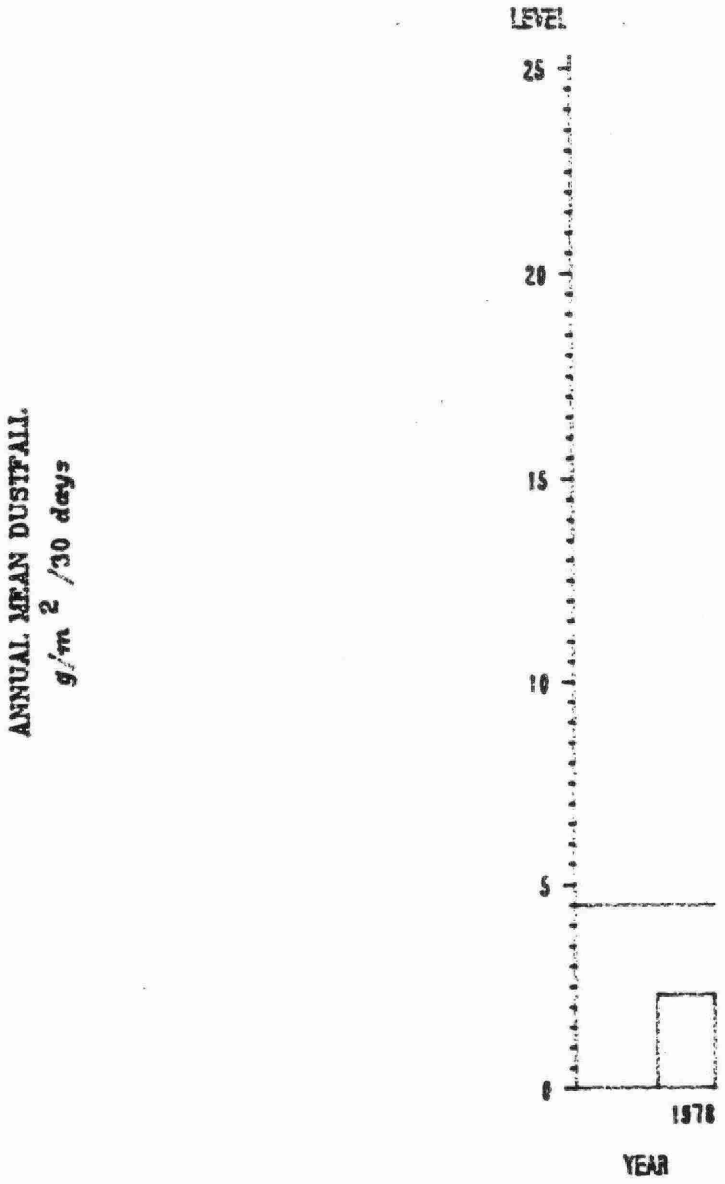


PROVINCIAL CRITERION:

4.5 g/m^2 /30 *days (1 Year Period)*

Figure 1

ANNUAL MEAN DUSTFALL LEVELS COLLECTED AT GILLIES STREET, STATION 72026, TIMMINS FROM MARCH, 1978 TO NOVEMBER, 1978

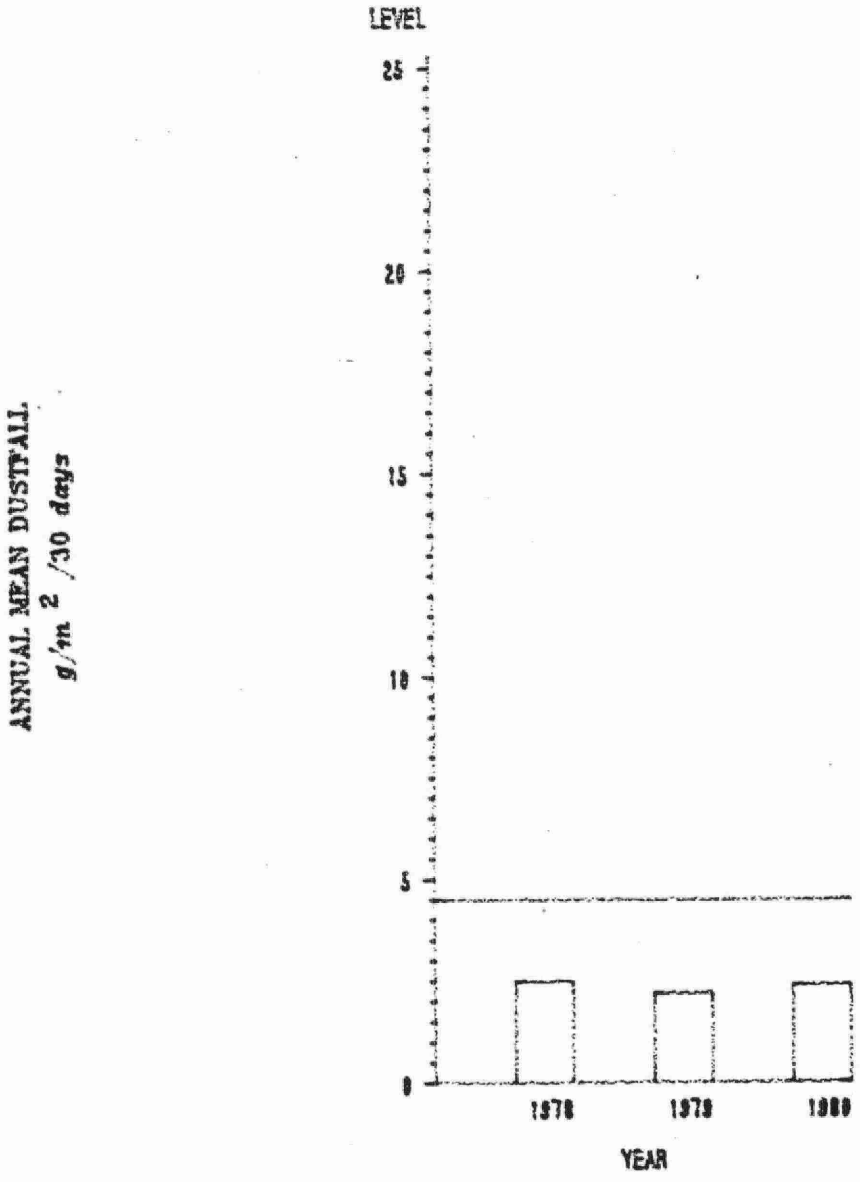


PROVINCIAL CRITERION:

4.5 g/m 2 /30 days (1 Year Period)

Figure 2

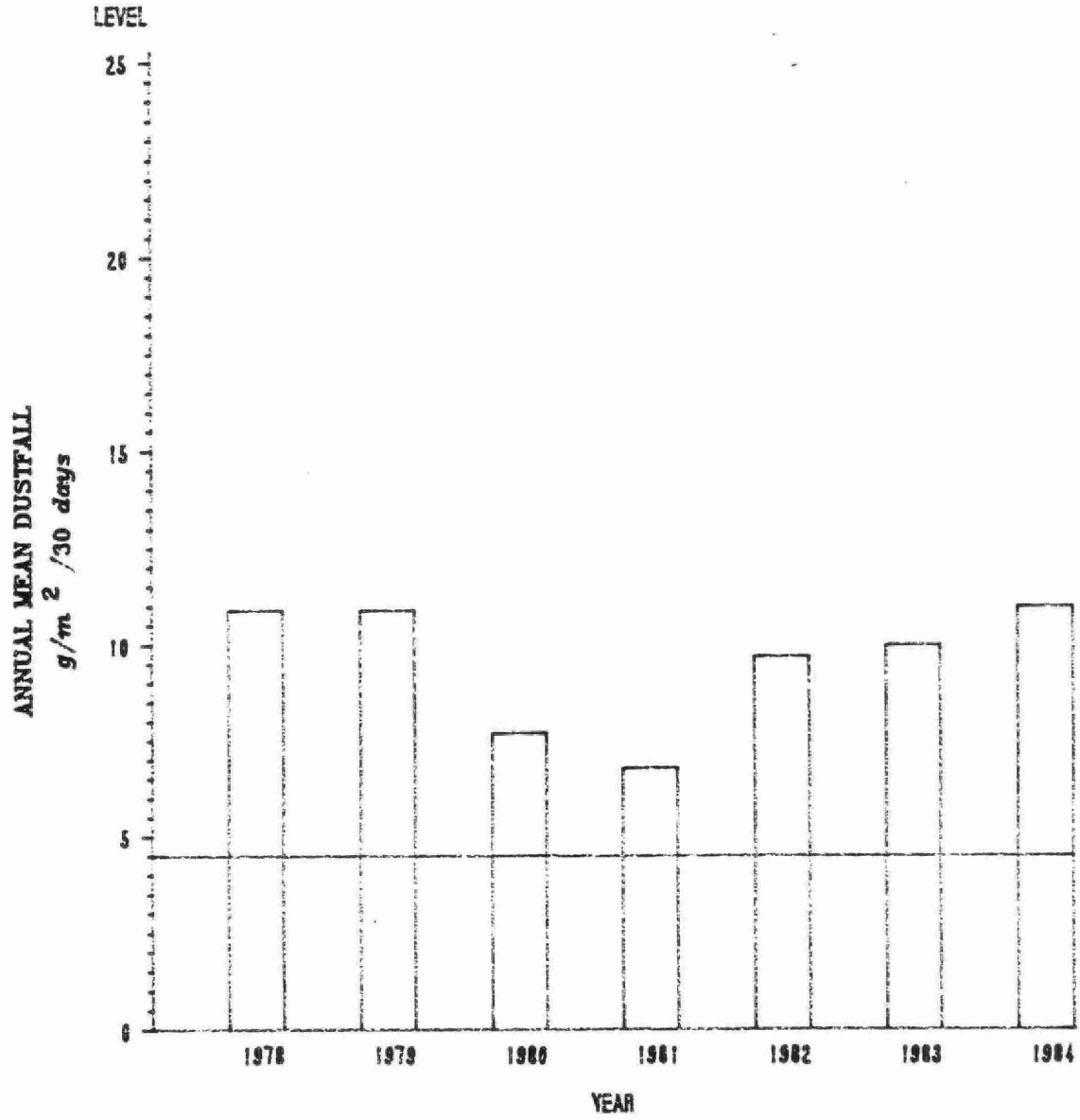
ANNUAL MEAN DUSTFALL LEVELS COLLECTED AT NOTRE DAME TRAILER PARK, STATION 72028 TIMMINS FROM MARCH, 1978 TO JULY, 1980



PROVINCIAL CRITERION:
4.5 *g/m* ^{2} */30 days (1 Year Period)*

Figure 3

ANNUAL MEAN DUSTFALL LEVELS COLLECTED AT WAFERBOARD CORPORATION LTD., STATION 72034 TIMMINS FROM MARCH, 1978 TO DECEMBER, 1984



PROVINCIAL CRITERION:
4.5 g/m^2 /30 *days* (1 *Year Period*)

Figure 4

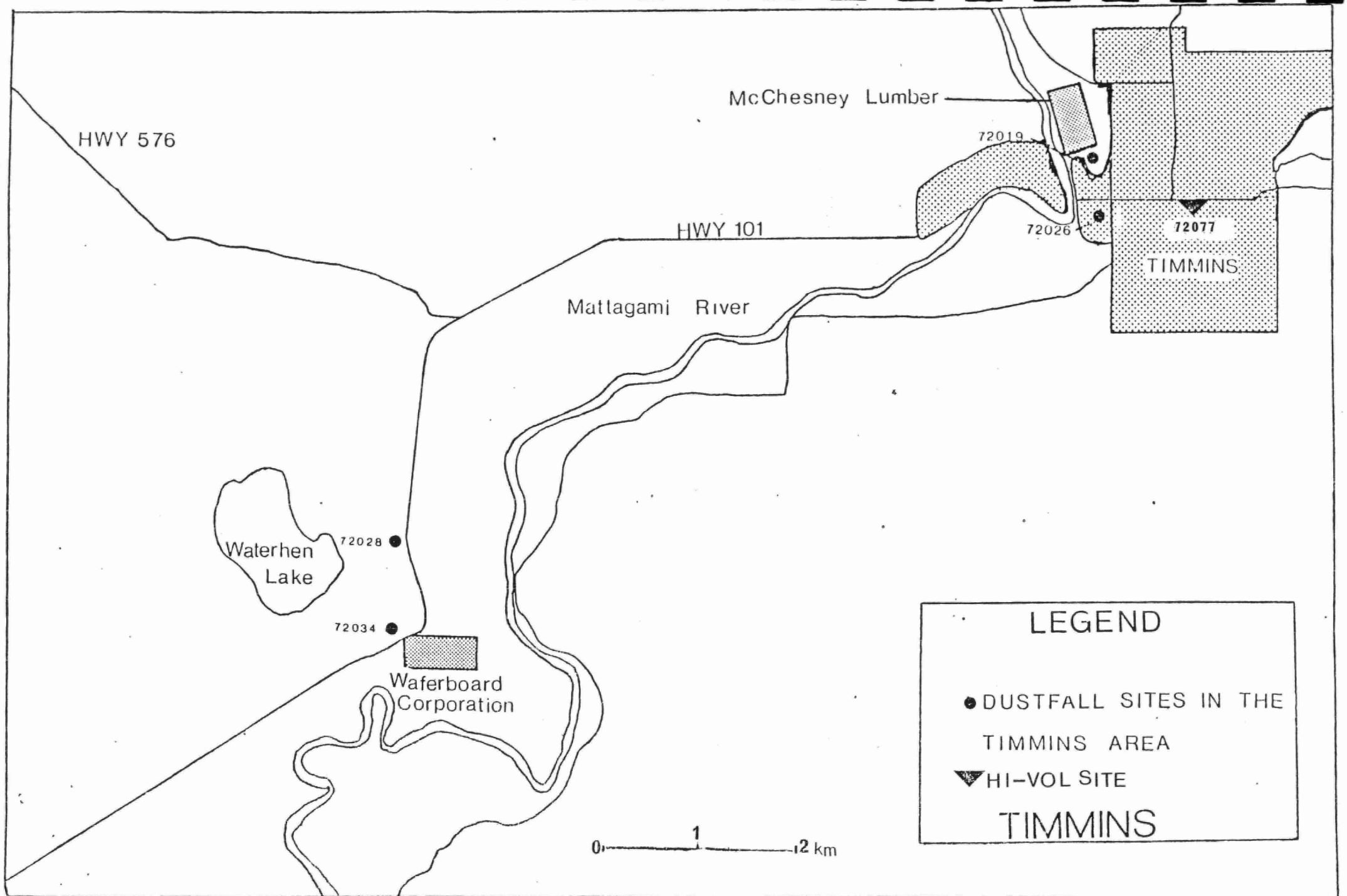

McChesney Lumber
HWY 576
72019
HWY 101
72026
72077
TIMMINS
Mattagami River
Waterhen Lake
72028
72034
Waferboard Corporation
LEGEND
DUSTFALL SITES IN THE TIMMINS AREA
HI-VOL SITE
TIMMINS
0
1
2 km

Fig. 5

APPENDIX

High Volume Sampling

The high volume (hi-vol) sampling technique determines the mass concentration of suspended airborne particulate (<100 um) by drawing a known volume of air through a pre-weighed filter medium. Standard operation of the sampler involves air flow rates from 0.9 to 1.4 m^3/minute and the use of a Gelman AE glass fibre filter. The sample is collected over a 24-hour period, midnight to midnight, every six days. The six-day operating schedule is pre-determined and is consistent throughout Canada and the United States. This six-day sampling is considered to be representative of the air quality over a year.

Two criteria for desirable air quality exist for total suspended particulate matter. One is 120 ug of suspended particulate per cubic metre of air (ug/m^3) averaged over a 24-hour period. The other is an annual geometric mean of 60 ug/m^3. The 24-hour criterion is based on impaired visibility and adverse health effects (in combination with sulphur dioxide), while the annual criterion is based on public awareness of suspended particulate and subsequent aesthetic effects.

High volume samples collected in the City of Timmins during 1984 were also analyzed for trace metals. Samples were analyzed for arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel and zinc.

APPENDIX

Dustfall Monitoring

Dustfall (total) comprises of larger, more visible, particulate matter which settles out from the atmosphere by gravity. It is measured by exposing an open top plastic jar for approximately 30 days.

The total amount of dustfall is determined by weighing the contents of the jar and expressing the results in $g/m^2/30$ days.

The settleable particulate collected in the dustfall jar can be separated into a soluble and an insoluble fraction for further analysis. The insoluble portion can be examined using an optical microscope to determine the composition of the particulate.

Although this method of sampling can be variable and is dependant on external factors such as wind and the amount of rain and/or snowfall during the sampling period, it is very useful in determining the amount of settleable particulate in the atmosphere.